

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2020****Subject Code:2171401****Date:19/01/2021****Subject Name:Food Standards and Quality Assurance****Time:10:30 AM TO 12:30 PM****Total Marks: 56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

**Q.1 (a) Answer the following: 03**

- i. Top management must be committed towards quality. Justify the statement.
- ii. What is the mandate of Bureau of Indian Standards?
- iii. Name the respective Indian Government Ministries which governs the following: Food Safety and Standards Authority of India and Standards of Weight and Measures Act

**(b) What is  $6\sigma$  accuracy? State the significance of process capability and process capability index. 04****(c) Match the entries of Column-I with most befitting entities of Column-II and reconstruct a matched table. 07**

| Column-I                                      | Column-II            |
|---|----------------------|
| H: $\{\mu = 6 \text{ \& } \sigma^2 \geq 16\}$ | Market research      |
| Binomial distribution                         | Large sample size    |
| Gustation                                     | Product difference   |
| Efficient estimator                           | Chemical sense       |
| Duo-trio test                                 | Variance = Mean      |
| Poisson's distribution                        | Composite hypothesis |
| Monadic test                                  | Least variability    |

**Q.2 (a) What is Poisson's distribution? In a large shipment of food articles 2% are known to be defective. Using Poisson's distribution, calculate the probability that in a sample of 1200 articles from the shipment, there are 24 or fewer defectives? 03****(b) The frequency distribution of weights (in g) of a product drawn randomly from a large lot is as follows: 04**

| Class Interval | 10-20 | 21-30 | 31-40 | 41-50 | 51-60 |
|----------------|-------|-------|-------|-------|-------|
| Frequency      | 03    | 15    | 36    | 32    | 16    |

Calculate the following:

- (i) The average weight of the packed food in g.
- (ii) Median of the distribution.
- (iii) The value of the most frequently occurring observation.
- (iv) The average deviation of packet weight from its mean value.

**(c) Explain simple, composite and Null hypotheses giving examples. What is critical region? Discuss the possible decisions that could be taken in any statistical hypotheses test process. What are the likely errors? Which type of error is more risky and why? Explain with practical examples. 07**

- Q.3 (a)** Discuss NABL accreditation. **03**
- (b)** Name the autonomous body which represents India at Codex Alimentarius Commission (CAC). Which two organization jointly established CAC? Briefly discuss the mandate of CAC. **04**
- (c)** Define Food Safety and safe quality food. Explain HACCP concept along with its pre-requisite programs and principles. **07**
- Q.4 (a)** What are major modifications done in ISO 9001:2015 standard compared to ISO 9001:2008. **03**
- (b)** Explain Ishikawa diagram? **04**
- (c)** What is AGMARK? Draw AGMARK logo that is allowed to be printed on AGMARK certified food products. How AGMARK standards are different from FSSAI food product standards? **07**
- Q.5 (a)** Answer the following briefly: **03**
- Define gustation.
  - Calculate the degrees of freedom Normal distribution.
  - What is Control sample?
- (b)** What is t-test? An FFS machine was purchased to pack 50 g packets. For testing its filling accuracy, a large population of filled up packets were produced. From this lot, a random sample of 10 packets were picked up and weighed. The weights in gram were recorded as 51, 48, 51, 45, 44, 46, 49, 46, 49 and 46. Examine at  $\alpha = 5\%$  if the filling machine is working as per its rated capacity. [Take  $t = 2.262$  at d.f. = 9 &  $\alpha = 5\%$ ] **04**
- (c)** Explain the importance of Normal distribution in quality control and state its properties. **07**
- Prove that  $N(x) = \sqrt{\frac{5}{\pi}} e^{-3(x-5)^2}$ ;  $-\infty < x < \infty$ , represents a Normal distribution function. Calculate its mean, standard deviation and variance.
- Q.6 (a)** Measurement of % total solids performed on random samples of two brands of a food product yielded the following results: **03**
- |         |      |    |    |    |      |
|---------|------|----|----|----|------|
| Brand A | 36.5 | 32 | 33 | 35 | 33.5 |
| Brand B | 36   | 32 | 39 | 34 | 37   |
- It is claimed that brand B has higher total solids than brand A. Examine this claim at  $\alpha = 1\%$ . [  $t = 1.86$  at d.f. = 4 and  $\alpha = 1\%$  ]

- (b) State the criteria for good estimators? Explain the mathematical criteria for unbiasedness and efficiency of point estimate of a population parameter? A random sample of 700 retorted cans of pineapple squash was drawn from a large consignment ready for export. Out of these 140 were found damaged. Determine 95% & 99 % confidence limits for the proportion of damaged cans in the consignment. 04

| $\alpha$ | Critical value of statistic |
|----------|-----------------------------|
| 1%       | 2.58                        |
| 5%       | 1.96                        |

- (c) Explain the following briefly: 07
- Level of significance
  - Neyman and Pearson *lemmas*
  - Numerical scoring test
  - UMVUE
  - Regression analysis
  - ANOVA
  - Producers and consumer's risk
  - Two tailed tests

**Q.7** (a) Enlist the advantages of 5'S concept. 03

(b) Briefly explain KAIZEN and Zero defect concepts. 04

(c) Draw diagrammatic representation of Transition TQM model and Integrated TQM model. Enumerate the differentiation between two models. 07

**Q.8** (a) Explain the relation of value addition with customer satisfaction with the help of diagrammatic representation. 03

(b) Briefly discuss SWOT Analysis and Customer window concept. 04

(c) Define Quality Control and Quality Assurance. Discuss the functions of Quality Assurance department of a medium size pickle industry. 07

\*\*\*\*\*